# *Air Quality and GEOSS*
# *GEO VI Plenary*
# *Washington DC*

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*Earth Science Serving Society*

# Applied Sciences Program

## *Program Strategy*

Goal 1: Enhance Applications Research

Advance the use of NASA Earth science in policy making, resource management and planning, and disaster response.

Goal 2: Increase Collaboration

Establish a flexible program structure to meet diverse partner needs and applications objectives.

Goal 3: Accelerate Applications

Ensure that NASA's flight missions plan for and support applications goals in conjunction with their science goals, starting with mission planning and extending through the mission life cycle.

# Applied Sciences Program

## *Program Strategy: Implementation Menu*

- **Earth Science Application Collaboratories**
  *Create integrated, multidisciplinary approaches to real-world problems*
- **Earth Science Applications Teams**
  *Ensure that all available NASA Earth science resources are utilized for each application area*
- **Feasibility Studies**
  *Investigate ideas for innovative applications*
- **Earth Science Decisions Projects**
  *Incorporate mature applications into end-user decision making processes*
- **Mission Applications Support**
  *Integrate applications needs into mission planning*
- **Joint Solicitations with Research Organizations**
  *Create new knowledge needed for applications*
- **Joint Solicitations with End User Organizations**
  *Accelerate transition of applications to societal benefit*

# Air Quality Program

## *Purpose and Themes*

Program Purpose

Facilitate the application of NASA Earth science knowledge, satellite products, and modeling capabilities to air quality management and policy functions,

particularly functions associated with the implementation of air quality standards, policy, and regulation for environmental, economic, and human welfare.

Programmatic Themes

- Air Quality Planning
- Air Quality Policy & Compliance
- Air Quality Forecasting
- Climate & Air Quality
- Emissions Inventories
- *Programmatic Activities (studies, outreach, etc.)*

# Air Quality Program

## *Present Approach & Path*

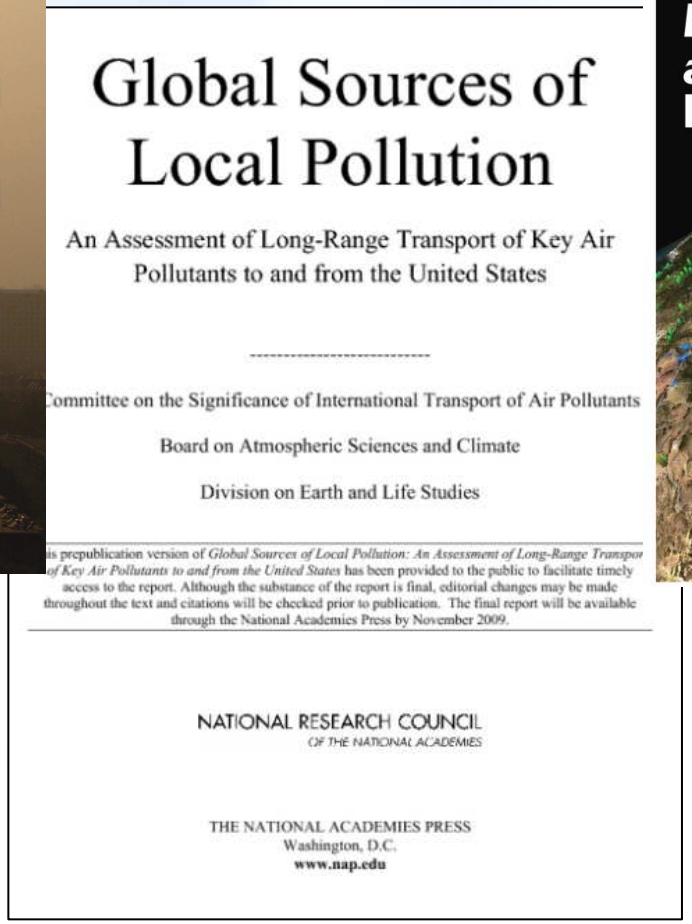
| | | |
|---|---|---|
| AIRNow | BlueSky | AIRQuest/RSIG |
| AIRPACT | NW-AIRQUEST | CMAQ |
| AQS | NOAA-IDEA | NAAPS |
| VIEWS/TSS | GIOVANNI | AIRNow-Tech |
| DataFed | NEI | SERVIR |

- Deliberate effort to introduce NASA observations into broad range of AQ decision-support tools. Targeted efforts at CMAQ for depth in that widely used tool.

- Building on this progress, new efforts focus on data fusion/integration, AQ modeling, and analysis tools for routine, sustained use. Plan to work through existing end-user organizations for these systems & tools (e.g., CMAS user group).

- 2010+: More applied research (e.g., use of models with observations to enhance information content). Greater focus on key, enabling techniques and applications-oriented products. Address access to international data sources.

# Air Quality Program



Global Sources of Local Pollution

An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States

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Committee on the Significance of International Transport of Air Pollutants

Board on Atmospheric Sciences and Climate

Division on Earth and Life Studies

is prepublication version of *Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States* has been provided to the public to facilitate timely access to the report. Although the substance of the report is final, editorial changes may be made throughout the text and citations will be checked prior to publication. The final report will be available through the National Academies Press by November 2009.

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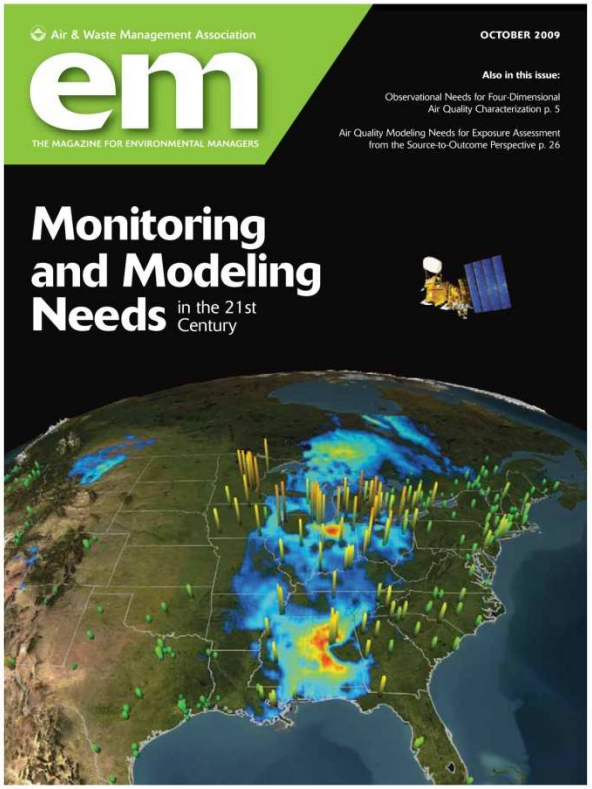
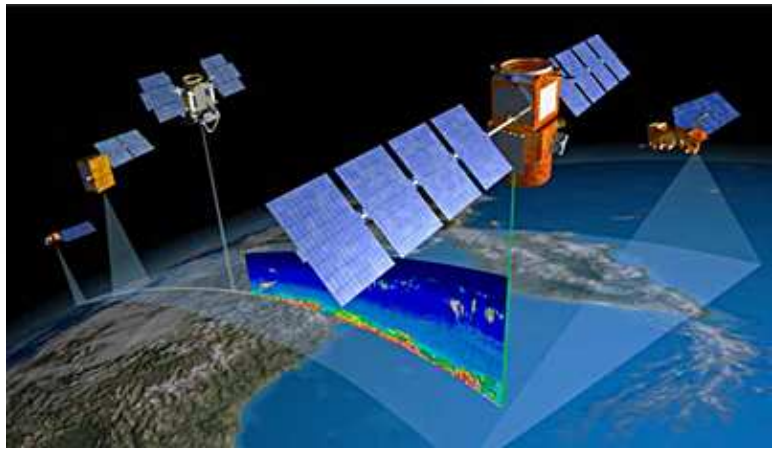


# Some Key Air Quality Satellite Sensors

# Example: NASA 3D-AQS Project

(Hoff et al., JAWMA, 2009; http://alg.umbc.edu/3DAQS)

- *Integrate* satellite sensor and lidar data into EPA's air quality data systems: AIRQuest, RSIG NOAA NESDIS AQS system: IDEA
- Provide greater *accessibility* and *usability* of satellite and lidar data to users of these systems through IDEA and US Air Quality Smog Blog
- Enable monitoring in *horizontal* and *vertical* dimensions for forecasting and retrospective analysis

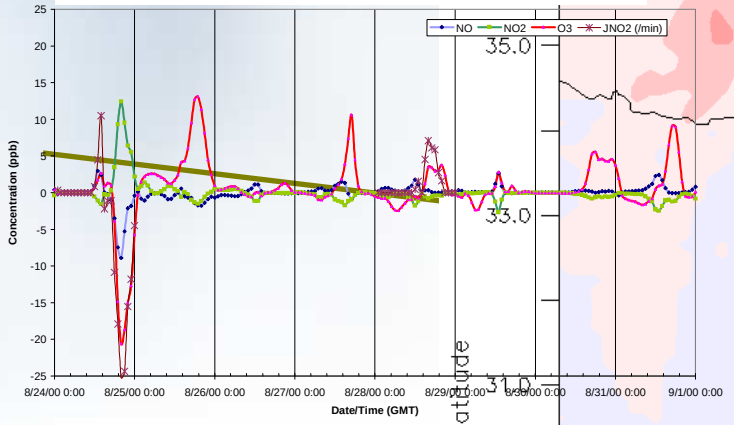


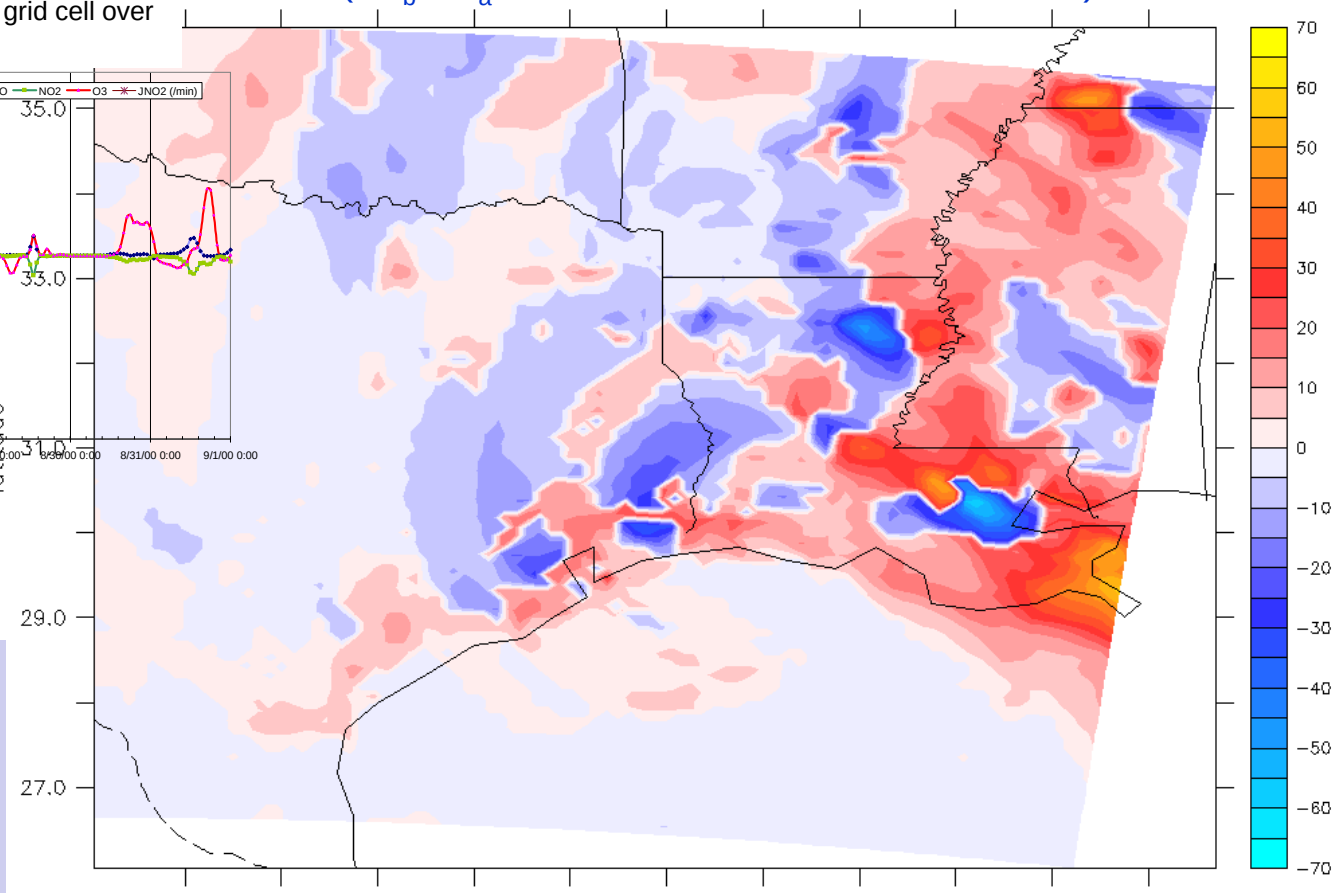
# Example: Use of Satellite Data to Improve the Physical Atmosphere in SIP Air Quality Decision Models

Richard McNider, Arastoo Pour Biazar, Kevin Doty, Don Moss, Scott Mackaro, Stephanie Haines, **University of Alabama in Huntsville;** Gary Jedlovec , **NASA Marshall Space Flight Center;** William Lapenta, **NOAA/EMC;** Jon Pleim, Shawn Roselle, **EPA ,NERL/AMAD;** Bright Dornblaser, **Texas Commission on Environmental Quality (TCEQ),** Bob Cameron, **Minerals Management Service (MMS)**

Largest changes in O3 concentration due to use of observed clouds for the period of August 24, 2000, to September 1, 2000. ($O3_b$-$O3_a$, b=Sat. Observed Cloud, a=Control)

The differences between NO, NO2, O3 (ppb) and JNO2 from satellite cloud assimilation and control simulations for a selected grid cell over Houston-Galveston area.




**IMPACT OF PHOTOLYSIS ADJUSTMENT**

Corrections of up to 70 ppb for Ozone

# Earth Science Training Modules

## * International & US training creates demand for NASA data *

**Training Modules & Training Sessions**

•NASA Applied Sciences' Air Quality Program developed training materials to introduce managers and policy makers to NASA satellite observations

- Set of re-usable instructional modules
- Set of case studies for computer-based, hands-on learning

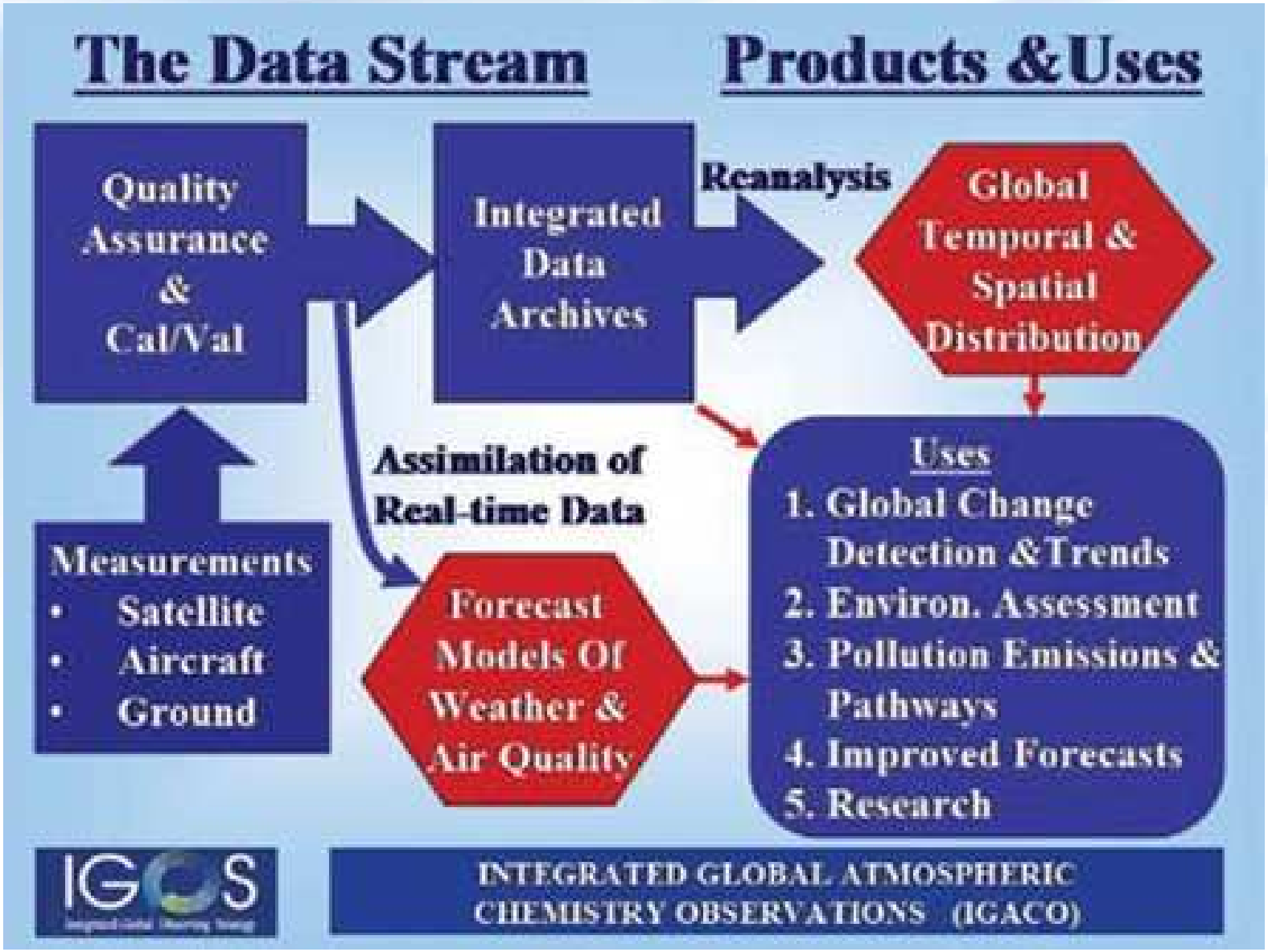
**Training in China ↑**

**Training in Singapore ↓**
***(done in concert with planning for 2011 Earth science study in SE Asia)***

•Often conducted in connection with international Earth Science Field Studies and involvement in international committees

- 7SEAS Earth Science Study in SE Asia
- Group on Earth Observations (GEO)
- UN Office of Outer Space Affairs' Graz Symposium for Satellite Applications (hands-on training for 80+ professionals from developing countries in 2007 & 2008)

# IGACO provides a framework for Communities of Practice



# Air Quality: Research & Applications

## *A Vision*

**AQ Community Using All Appropriate Observations**

- Smooth transition between current and future sensors (eg, MODIS & VIIRS)
- Private sector forecasters to gain confidence & build demand for observations/models
- AQ contractors of federal agencies, states are routine users of Earth observations/models
- Advocates for ACE, GEO-CAPE (and other international atmospheric satellites)

**Analysis & Visualization Tools Pull Data Seamlessly**

- Intelligent, interoperable systems can support advanced analysis
- Analysts/managers have & use right data products available at right time for right place

**Strong Public Familiarity, Demand, Expectations for AQ information**

- Earth Science supports stakeholder/media outreach to public

**Air Quality a successful example Nationally and Internationally**

- Successful example for US GEO, CEOS, International GEO
- Cooperation with ESA and increased international data sharing

**AQ Research & Applications communities iterate on key research (observations, science, modeling, etc.) and transitions to decision making**

# Thank You